

## **M. BOVIS INTRA-INDUSTRY COST SHARE PANEL**

**9 November 2018**

### **Final Report**

#### **1. Purpose**

- a) To present the Panel's advice on intra-industry cost share arrangements for the *Mycoplasma bovis* (*M. Bovis*) response.

#### **2. Key recommendations**

- a) Note the Panel went through a process of reviewing available information, receiving submissions from DairyNZ and Beef & Lamb NZ (the Industry Parties), and seeking additional relevant information from the Industry Parties and others to form its recommendations on the appropriate intra-industry share of costs for the *Mycoplasma bovis* (*M. Bovis*) biosecurity response.
- b) Note the Panel reviewed responses from both Industry Parties on a preliminary draft of this report, which resulted in changes to our approach and recommendations. In particular:
  - the '90%/10%' Initial Impact Assessment is not now used as a factor in the calculation of the recommended cost share (although it forms part of the context around our recommended cost share)
  - a measure of at risk farm-gate revenue was used to derive the recommended cost share
  - the at-risk factors used to derive the recommendation were refined
  - the recommended initial cost share was modified
  - We have moved away from a specific recommended time frame to review the cost shares.
- c) The Panel's opinion on the appropriate apportionment of cost share in accordance with clause 5.1.11 of the Government Industry Agreement for Biosecurity Readiness and Response (GIA) Deed is that DairyNZ be allocated 95% of the total industry cost share, and Beef & Lamb NZ 5%.
- d) The Panel considers its recommended approach is appropriate for setting the initial cost share. If, in future, additional data becomes available on the probability of clinical infection by animal type, increased costs per infected animal, and the impact of the disease where no action is taken, the Industry Parties may choose to review the cost share based on that new information. The Panel has developed a more detailed formula it considers appropriately allocates costs amongst beneficiary sectors under GIA once sufficient empirical information is available.

### 3. Background

- a) *M. Bovis* was first detected on a New Zealand farm in 2017. Investigations led to further discoveries, culminating in a biosecurity response being initiated.
- b) In 2014 a new way of delivering biosecurity activities through partnership between the Crown and industry was introduced with the establishment of the Government Industry Agreement for Biosecurity Readiness and Response (GIA). The process to join GIA has been variable and the confirmation of *M. Bovis* pre-dated the Industry Parties joining GIA.
- c) As information about *M. Bovis* emerged, in addition to the Crown, the Industry Parties identified the sectors they represent (in terms of the GIA definitions) as the response beneficiaries.
- d) The Crown approached the response and decision making as if the Industry Parties had signed the GIA Deed, recognising that the beneficiary sectors were on the path to joining GIA, and that if the timing had been different this would have been a response under GIA.
- e) In the initial months of unfolding information and uncertainty, cost shares were agreed between the Crown and industry, including a dollar amount to be payable by the industry beneficiaries to cover the response costs up to the end of the initial phase of the response, before a decision was made by Cabinet (with the support of the Industry Parties) to continue efforts to eradicate. The agreement on this was contingent on the industry sectors' representative bodies being able to collect money from their members via a levy mechanism. It was intended this would be pursuant to having a signed Operational Agreement (OA) and the OA in turn was dependent on GIA membership.
- f) Consequently, while the response progressed and response governance operated as it would if the parties were all GIA members, the relevant parties (the Industry Parties and MPI) worked in parallel on:
  - progressing GIA applications for the Industry Parties
  - developing an *M. Bovis* response OA for signing by the Industry Parties and MPI
  - determining the intra-industry cost shares to put into the OA in accordance with section 5.1 of the GIA Deed.
- g) It is this latter point which is the reason for the Panel's work.

### 4. The Panel's task

- a) After the Industry Parties failed to reach agreement on intra-industry cost shares, they agreed to appoint a technical expert panel to provide non-binding advice on cost share arrangements.
- b) The membership, roles, and arrangements, along with the specific questions the Panel was charged with addressing, are described in the terms of engagement agreed by all the parties. The core question the Panel was charged with advising on was:
 

*'How should industry cost-share under the M. Bovis OA be apportioned between the Industry Parties in accordance with clause 5.1.11 of the GIA Deed' [Terms of Engagement Schedule A]?*

## 5. The Panel's approach

a) Clause 5.1.11 of the GIA Deed states:

*“Where there are multiple industry Signatories to an Operational Agreement, the industry cost-share will be determined based on the proportional benefits to each industry (including any non-Signatory beneficiaries) in avoiding the impact of the unwanted organism.”*

b) The Deed does not stipulate the methodology that should be used. The Panel therefore developed a process comprising the following elements:

- consideration of available written material relevant to the task in hand (note the full list of key information sources is included in Appendix 2)
- consideration of existing OAs and the process and outcome of cost share negotiations
- invitation to the two industry sectors to make submissions and presentations to the Panel (separately) and to answer questions posed by Panel members
- consideration of written responses from the two industry sectors to additional questions posed by the Panel as its deliberations proceeded
- requests to MPI for access to relevant reports or technical information that it was thought to hold
- enquiries to the Technical Advisory Group (TAG) that MPI has set up to inform response decisions
- follow-up questions to the authors of the ‘90%:10% formula’ to which both industry sectors have made important reference
- consideration of feedback from the Industry Parties on the Panel’s preliminary report.

*Process:*

- regular meetings (via teleconference) of the Panel to share information, perspectives and interpretation, and to maintain flexibility of approach, within the project’s brief. This included direct discussion with both industry organisations, the authors of the Initial Impact Assessment, MPI representatives, and the TAG.
- progressively, the Panel sought to reach consensus on:
  - the key principles that would underpin the Panel’s conclusions, including understanding the requirements of the GIA Deed in this regard
  - ‘agreed’ facts/data, meaning data where the two sectors already agree and/or where there was reliable, authoritative evidence available
  - Finally, the Panel considered those areas where there were no clear ‘answers’ and where the Panellists’ judgement needed to be applied.

## 6. Out of scope

a) The Panel accepted as ‘given’ the decisions that have been made elsewhere and are therefore outside of the scope of the terms of engagement, namely:

- the decision on whether to attempt to eradicate, and the operational decisions (and quantum of costs) that follow the decision to eradicate
  - the decision that the Industry Parties are the only beneficiary sectors
  - the public to industry cost share
  - the decision whether the response should be continued.
- b) Potentially, based on our cost share recommendations, one or more Party may view that the cost of its involvement in the response outweighs the perceived benefit. Considerations of value and affordability are out of scope for the Panel.
- c) The Panel's task is to provide a recommendation on the split of costs between the dairy and beef sectors. Whilst in our deliberations on reasonableness we have discussed how costs will land on each sector, the Panel has not considered how levies should be calculated or applied.

## 7. Criteria adopted by the Panel

- a) The Panel's Terms of Engagement include provisions giving the Panel wide discretion as to how to conduct their inquiries, what submissions and evidence to take into account, from what source, and what weight to give that evidence. The Panel is not bound by the rules of evidence (*Clause 17 of the Terms of Engagement*).
- b) The Panel, in accordance with the Terms of Engagement, applied clause 5.1.11 of the GIA Deed. This necessitates a test based on the benefit of avoiding the impact of the unwanted organism. That requires a counterfactual to be developed. The Industry Parties agreed the appropriate way to measure the benefit to the Industry Parties of avoiding the impact of *M. Bovis* is a 'counterfactual' that is an estimation of the loss each party would suffer if the impact of *M. Bovis* was not avoided.
- c) Without a specified methodology in the GIA Deed, the Panel has had to look to other sources of principle including, but not limited to, the wider GIA Deed and past OAs to guide its development of a recommended methodology. The Panel does not consider any one of these sources to be determinative. The Deed clause 5.1.8 was a useful reference point, as this does include some methodological elements, as follows:

*5.1.8 Each cost-share represents the proportion of public to industry benefit that is likely to accrue in avoiding the impacts of the unwanted organism, as well as a fixed proportion to cover exacerbator cost. The proportion of public to industry benefit is determined by Signatories under an Operational Agreement. Signatories will:*

- a. Consider impacts of the unwanted organism on the public and industry (including non-Signatory beneficiaries).*
- b. Calculate benefits using a mixture of quantitative values (New Zealand dollars), where known, and qualitative statements when it is difficult to value in dollar terms.*
- c. Assess and agree the benefits achieved as a result of the activity over a one-year period assuming that: the unwanted organism spreads to its full possible range within New Zealand, no response has taken place, and minimal management options have been implemented; and then:*

- *calculate the proportion of public benefit to industry benefit and assign the response to one of the cost-share categories set out in Schedule 2*
  - *determine whether additional non-financial components should change the classification to another cost-share category.*
- d) However, clause 5.1.8 is clearly directed to the assessment of the public to industry benefit, not the intra-industry cost share. Both Industry Parties, in their submissions, did not support a strict application of clause 5.1.8 to the intra-industry share. The Panel agrees and has used this provision as guidance, but not more than that. The Panel considered that a one year time frame for considering *M. Bovis*' spread 'to its full extent' is too short (given the real life experience of *M. Bovis* elsewhere in the world). Also, given the newness of the outbreak, there is insufficient data currently to measure impact on farm-gate revenues with any degree of confidence (though this is the Panel's preference for the longer term assessment).
- e) The Industry Parties both signed the 'Combined Livestock Sector Letter' to MPI of May 2017. The letter set out the key terms under which the livestock sector was prepared to enter into GIA and OAs with the Crown. The Panel understands it was assented to by MPI. Both Industry Parties have confirmed they wish the Panel to place some reliance on the letter, with Beef & Lamb NZ particularly noting its importance. The letter noted at clause 1.10 that:
- "Intra industry cost sharing would be guided by the principle that shares should be based on the value of the industry measured at the first point of sale ("farm-gate value" determined by five year rolling average figures) and the relative production impacts, risks, and trade impacts on the industry. Trigger points may be written into Operational Agreements to initiate reviews in light of significant changes."*
- f) In principle, the Panel agrees with this approach. In practice, the first part (farm-gate value) is readily available information, but the second part (an impact rating based on relative production impacts, risks and trade impacts) eludes straightforward quantification for the *M. Bovis* response (although both Industry Parties agree there are no trade impacts expected with *M. Bovis*).
- g) The Panel notes that the letter references the values of the industry. This is consistent with the Brown Marmorated Stink Bug (BMSB) OA and the Australian model for applying cost shares between species affected by a disease. These models, and that anticipated by the letter, apply an impact rating (i.e. an estimate of the percentage of revenue each industry will lose as a consequence of the disease) to the total revenues of each industry.
- h) However, the Panel considers that this approach is of limited practical application in the present circumstances. As discussed elsewhere in this report, the Panel has insufficient data to generate an impact rating based on relative production impacts. The Initial Impact Assessment, which both Industry Parties place emphasis on (albeit with differing interpretations), cannot be scaled by relative industry revenue as it expresses the relative costs borne by an average beef farm compared to an average dairy farm rather than costs as a percentage of each farm's revenue.

## 8. A conceptual framework for *M. Bovis* cost share allocations

- a) On the basis of the above, and in the absence of an agreed methodology, the Panel has developed a 'bottom-up' cost model, itemising the different risks in key industry sub-sectors, and accommodating the size differences between these sub-sectors. The conceptual framework offers a good model for future calculation once better data from the New Zealand environment is available.
- b) The Panel considers that:
- The proportional benefit is established by measuring against a counterfactual.
  - The counterfactual is the position if the incursion continued with no response under the Biosecurity Act.
  - The counterfactual includes likely management steps<sup>1</sup> industry participants would take in the absence of a response. The Panel considered that the costs of these likely management steps for beef would be significantly lower than for dairy as beef farmers have alternate management options relatively readily available to them.
  - Due to the relatively slow spread of this disease that would occur under an uncontrolled response scenario, assessing the benefits of a national response one year after detection is not appropriate (as used in clause 5.1.8 of the GIA deed for the Crown/industry cost share). The Panel understands both Industry Parties agree with this view.
  - A 10 year time period to assess the counterfactual enables cost variation over time to be smoothed, and accounts for the likelihood that management steps costs would increase, but be counterbalanced by decreasing production losses. The Panel understands that assigning a specific time period for the counter-factual is somewhat arbitrary and our final analysis takes into account some factors that are not tied to a specific timeframe. Based on the information considered by the Panel, it is assumed that after 10 years with no national response the disease would be relatively widespread.
  - Each beneficiary's willingness to pay should reflect the expected benefits it will receive from the biosecurity response. The expected benefits are the expected avoided costs of the damage, including treatment costs, production losses and likely management steps taken on-farm to avoid the clinical appearance of the disease.
- c) The key variables that determine the costs of damage for each industry are:
- the probability of clinical symptoms occurring in any one year, once the disease is widespread, assuming no eradication response and the likely management steps taken by farmers

---

<sup>1</sup> We use the term 'management steps' to describe the operational changes farmers would make to adjust for the presence of *M. Bovis* in their herds. This would cover the 'farm system changes' mentioned in the DairyNZ submission.

- the increased costs per animal that is clinically infected, as a share of that animal's production value<sup>2</sup>
  - the number of animals in each of the dairy and beef sectors and those animals' value.
- d) The Panel has developed a model using the above criteria to determine cost shares for each sector, and this is attached in Appendix 1. We had hoped to access suitable data (from New Zealand sources, by extrapolation from other jurisdictions and/or from expert opinion such as that provided by the TAG). However, quantitative data is scarce, and the experts' opinions were broadly indicative, but with no hard data to back it up. As a result, we could not populate the model with data.
- e) The Panel understands that the GIA Deed covers new-to-New Zealand organisms and, therefore, a lack of quantitative data on impact at the start of a response will be the norm. We also note that it will never be possible to measure a 'pure' counterfactual, as the existence of the response changes the activities and costs in the impacted sector — so the true impacts of an organism left to run to its full extent will never be known. We consider *M. Bovis* in this regard is unusual in that there is very little definitive clinical information available that assists cost share determinations, nor is there experience in comparable jurisdictions which we can readily extrapolate to New Zealand. This is not the case with other pests and diseases where, based on previous biosecurity incursions and cost share discussions, it appears that the existing state of knowledge makes extrapolation to New Zealand circumstances somewhat easier.
- f) The Panel is conscious the Industry Parties are looking to it to provide definitive answers, and the Panel is endeavouring to do that. However, there is simply not sufficient reliable or estimated data to populate the model in Appendix 1 with confidence.
- g) Consequently, using the Panel members' combined knowledge and professional judgment, and the information it could access, the Panel decided to:
- craft an initial cost share proposal, compiled by weighing the best evidence and opinions of experts that is currently available
  - document what the Panel believes would constitute an appropriate longer term formulation. Implementation of these formulae may well be possible in future, if sufficient New Zealand data is available to populate key terms with a greater degree of confidence.<sup>3</sup>
- h) As noted, the Panel found it extremely difficult to obtain expert quantitative advice on the likely progress of *M. Bovis* in the absence of a national response. However, the Panel makes the following observations:

---

<sup>2</sup> These increased costs should include the decline in profitability per animal.

<sup>3</sup> We acknowledge the fact that emerging New Zealand-specific data will not be based on the no-response scenario as we envisage in our counterfactual, since New Zealand has committed to eradicating *M. Bovis*. However, in future we believe more information on how the disease plays out in a New Zealand context, even *with* a response, will still be more helpful for informing cost share discussions than what we currently have to hand.

- The TAG experts' guidance was not as clear on the simplicity of eliminating clinical effects from calf-rearing as some industry submissions maintained. TAG experts stated that citric acid as a sterilant was difficult to use effectively and therefore pasteurisation and/or milk powder were more probable (and expensive) solutions for calf-rearing.
  - The TAG experts discussed the extensively farmed beef situation in Australia and the Panel understands their advice is that the clinical impacts of *M. Bovis* are virtually non-existent. This accords with the views of the authors of the Initial Impact Assessment, who also assessed clinical or sub-clinical impacts for extensive beef as likely to be "extremely low".<sup>4</sup>
  - Beef feedlots do create a greater risk, however the cattle numbers in New Zealand finished in this manner are low. There are systems such as the techno system which are somewhat intensive and may affect disease outcomes, but the interplay with *M. Bovis* is unknown at this stage. The Panel's best estimate is that the number of beef cattle finished in feedlot and techno systems in New Zealand is in the order of 100,000.
- i) The TAG reported the experience in the United Kingdom was that beef operations experience greater clinical impacts than dairy, but also acknowledged that both dairy and beef systems were intensive. New Zealand does not have significant intensive farming systems, but the UK experience at least illustrates that the risk of impact to New Zealand beef farms is not so low as to be negligible. The Panel took, from the advice it heard, that in Australia there are initial higher impacts when *M. Bovis* is diagnosed and there are ongoing testing and management costs, but these diminish over time (and relatively quickly). The sparse economic data from the US, referenced elsewhere in this report, indicates a very low economic impact on beef farmers. The Panel recognises that US farming systems are also very different to those in New Zealand.

## 9. Proposal for initial cost shares

### *The 90%/10% Initial Impact Assessment*

- a) In its deliberations, the Panel needed to consider the 90%/10% impact assessment (the 'Initial Impact Assessment') developed by employees of DairyNZ and Beef & Lamb NZ as this featured prominently in the submissions of both Industry Parties. In the absence of rigorous New Zealand-based data, this gave an important view of how the experienced and informed technical experts from the two affected sector representative organisations assessed the likely relative impacts.
- b) The Panel notes that this assessment was a judgment-based estimation proposed by two industry professionals. Its purpose was not to form the basis of this later Panel review. However, both Industry Parties made reference to this estimate in their submissions, stressed its importance to the Panel, and adopted it as a starting point for their own proposed cost shares —though with different interpretations of how it should be scaled. Consequently, the Panel spent quite some time exploring the meaning of the Initial Impact Assessment.

---

<sup>4</sup> Morley-Barnao email, 18 May 2018.



- c) Although when interviewed the two authors indicated general agreement about the interpretation, the Industry Parties do not agree, now, on the interpretation or application of the Initial Impact Assessment. The Panel initially concluded from its discussion with the authors, and in combination with other sources and its own expertise, that 90%/10% would be an appropriate starting point to assess cost shares, although the Panel's use of this ratio departed from the differing interpretations of both Industry Parties. In particular, the Panel noted the comments from the two authors that anything higher than a 90%/10% split was unrealistic. A 95%/5% was deemed plausible, but intuitively (based on their skills and experience) 90%/10% felt right.
- d) However, given the Industry Parties' continued disagreement about the appropriate use of the Initial Impact Assessment, the Panel has ultimately concluded that it is not a useful basis for recommending a cost share. Any cost share calculation using the 90%/10% as a key input will continue to be highly contested between the Industry Parties, which will not help achieve a resolution.
- e) Therefore, in the Panel's final recommendation (below) the proposed cost share has been calculated without using the 90%/10% ratio as a starting point, although the Panel continued to use it as an informed reasonableness test for its own calculations.

*Other factors considered by the Panel: Animal proximity*

- f) The Panel needed to make judgments about the financial risk to sectors consequent to infection. It noted infection did not necessarily lead to clinical effects and financial loss, but animal proximity was a key factor. It concluded there is high financial risk if animals are kept close together and lower risk if they are normally more dispersed. A second factor leading to clinical disease is stress, caused by feed conditions, weather, other associated disease or the close animal proximity itself.
- g) This led to the conclusion that all dairy is at high risk of impact. In the beef sector, beef cattle finished in feedlots and other intensive systems and bulls used for mating cows are relatively high risk; hand-reared calves sold to beef for finishing are moderately high risk; and other operations (largely extensive beef) are extremely low risk.

*The interwoven system*

- h) The Panel heard arguments regarding the interwoven nature of livestock-based businesses and the consequent impacts on multiple revenue streams and on farmer behaviour to optimise post-*M. Bovis* conditions. In particular, these matters were stressed by DairyNZ in its submissions, and again in its feedback to the Panel's preliminary report.
- i) There is an intuitive logic to the argument that *M. Bovis* is changing (and will further change) farming systems. The Panel spent considerable time considering the impacts on farming systems and the possibility of objectively quantifying them. However, eventually we reached the conclusion that the benefits or impacts of such ancillary matters are not certain enough to affect the overall cost share formulation, or create costs that are significantly slanted towards beef. These changes are taken into account to some degree, as the calf rearing, finishing bulls and

feedlot/intensive grazing of beef risk factors in our proposed initial cost share are in response to interaction with dairy.

- j) The Panel particularly noted the reports of the Australian experience where, after an initial high impact on farming activities (1–2 years) farmers in both industries were able to adjust to the presence of *M. bovis* without tangible negative impacts.
- k) The Panel accepts that where feedlots or other intensive methods are employed in the beef sector, such activities pose higher risk than other beef operations. The Panel also accepts that the effect of *M. Bovis*' presence may influence costs and practices for beef operations.

#### *Cost share calculation*

- l) The Panel's calculation of recommended cost share is based on an assessment of the relative at-risk revenue for each of the dairy and beef sectors, as follows.
  1. Risk factors are assigned to both industries' revenues. The risk factor is the risk of financial losses due to *M. Bovis* compared to an animal raised on a typical dairy farm which has a risk factor of 1.<sup>5</sup>
  2. All dairy income is rated as 1, where dairy income = KG/MS \* \$ per KG/MS for 2016/17.
  3. Then the various sources of beef revenue at risk from *M. Bovis* are rated between 0 and 1. Again, data for 2016/17 is used.
  4. Only the 2.4M beef cattle slaughtered (thus generating revenue) is considered, not the 3.6M total number of beef cattle.
  5. Bobby calves and vealers are excluded because they are slaughtered very young, before being exposed to the risk of disease.
  6. The cattle numbers, average weights and prices by type for 2016/17 are sourced from New Zealand Farm Facts.<sup>6</sup> Note this was adjusted to include the estimate of 100,000 service bulls as per the DairyNZ response to the email exchange with the Secretariat dated 29 October 2018.
  7. Dairy-beef calves are rated at 0.5 because this is an area of relatively high risk of infection.
  8. A rating of 0.5 is also used for feedlot/intensive beef — these are higher risk than extensive beef, but not as high as dairy.
  9. There will be some cost to beef farmers in trying to protect service bulls from *M. Bovis*, but this will be of a lesser order than for dairy farmers. A 0.5 risk factor is assumed.
  10. Extensive beef are accepted as being at "extremely low" risk of clinical impact from *M. Bovis*, but at greater than zero risk. A risk factor of 0.05 is assumed (i.e. 1/20 the risk of a dairy cow). This takes into account the DairyNZ argument around grazing.
  11. Dairy cows and dairy heifers are excluded from the at-risk revenue calculation for beef, because *M. bovis* related costs will land with, and be paid by, the dairy sector.
- m) Consideration of these factors leads to the calculation set out in the table on the following pages.

---

<sup>5</sup> This does not mean we are forecasting actual financial losses in levels. We seek only to compare potential proportionate losses in beef, relative to dairy.

<sup>6</sup> <https://beeflambnz.com/sites/default/files/data/files/nz-farm-facts-compendium-2018.pdf>

Estimates of at-risk revenue		
<b>Revenue generated from dairy cows</b>		
<b>Variable</b>	<b>Number/value</b>	<b>Source</b>
KGMS	1,851,000,000	DairyNZ Dairy Statistics 2016/17, Table 2.1
Milk price, \$/KG	\$6.47	DairyNZ Dairy Statistics 2016/17, Table 5.1
<b>Dairy revenue</b>	<b>\$11,975,970,000</b>	
<b>Beef stock numbers</b>		
<b>Stock type</b>	<b>Number</b>	<b>Source</b>
Dairy-beef calves	600,000	MPI Livestock slaughter data ( <a href="https://www.mpi.govt.nz/dmsdocument/1018-livestock-slaughter-statistics-for-sheep-cattle-goats-horses-and-pigs">https://www.mpi.govt.nz/dmsdocument/1018-livestock-slaughter-statistics-for-sheep-cattle-goats-horses-and-pigs</a> )
Feedlot cattle	100,000	as above
Service bulls	100,000	DairyNZ panel submission, and email from Carol Barnao dated 29/10/18
Extensive beef	790,000	Residual from 2.4M, MPI Livestock Slaughter numbers
Dairy heifers	90,000	MPI Livestock slaughter statistics
Dairy cows	720,000	MPI Livestock slaughter statistics
<b>Total</b>	<b>2,400,000</b>	MPI Livestock slaughter statistics
<b>Average weight of animals, KG</b>		<b>Source</b>
Dairy-beef calves	290	MPI Livestock slaughter statistics
Feedlot cattle	314	MPI Livestock slaughter statistics
Service bulls	305	MPI Livestock slaughter statistics
Extensive beef	315	MPI Livestock slaughter statistics

Dairy heifers	220	MPI Livestock slaughter statistics
Dairy cows	190	MPI Livestock slaughter statistics
<b>Average price per KG</b>		<b>Source</b>
Dairy-beef calves	\$5.00	The Panel assumes beef average price of \$5.00 per kg (supported by data on Beef & Lamb NZ website)
Feedlot cattle	\$5.00	Beef & Lamb NZ website
Service bulls	\$5.00	Beef & Lamb NZ website
Extensive beef	\$5.00	Beef & Lamb NZ website
Dairy heifers	\$5.00	Beef & Lamb NZ website
Dairy cows	\$4.00	DairyNZ Response to interim Panel report, Table 1
<b>Revenue generated by beef farms</b>	<b>\$3,069,950,000</b>	
<b>Risk factors</b>		<b>Source</b>
Dairy-beef calves	0.5	Panel estimate
Feedlot cattle	0.5	Panel estimate
Service bulls	0.5	Panel estimate
Extensive beef	0.05	Panel estimate
Dairy heifers	0.0	Panel estimate
Dairy cows	0.0	Panel estimate
<b>At-risk revenue generated by beef farms</b>	<b>\$651,962,500</b>	
<b>Cost shares</b>		
<b>Dairy</b>	<b>94.8%</b>	
<b>Beef</b>	<b>5.2%</b>	

- n) The ratings assigned to the risk factors are given by the industry experts, based on their skills and experience. These are necessarily subjective, given the lack of empirical data the Panel had

to work with. The base spreadsheet will be provided to the Industry Parties to enable other factors and ratings to be input as desired to inform their negotiations. The spreadsheet contains a tab showing several alternative cost share calculations based on different sets of risk factors. These are provided for the benefit of Industry Parties, but the Panel preferred to provide a single estimate around which Parties can negotiate, rather than providing a range.

#### *Reasonableness Tests*

- o) The above calculation gives a cost share of 94.8% for dairy and 5.2% for beef. To test the reasonableness of this the Panel considered alternate methods of calculation, as set out in the paragraphs below.

#### *Drawing on US experience*

- p) The TAG quoted published data on the impacts of *M. Bovis* in the US<sup>7</sup>, where the estimated impacts were US\$32 million for beef and US\$108 million for dairy per annum. The Panel notes the source data (Maunsell et al) urges significant caution in the use of this data and, therefore, the Panel only used it for comparative purposes. However, as a proportion of farm gate revenue, using 2011 data from the Food and Agriculture Organisation (FAO)<sup>8</sup>, this equates to 0.272% for dairy and 0.061% for beef.
- q) Applying these proportions to New Zealand industry farm gate revenue results in an implied cost of \$1.69 million for beef and \$29.68 million for dairy, for a pro-rated cost share of 5.40% for beef and 94.60% for dairy.
- r) However, this would need to be adjusted down for beef if applied in a New Zealand context, due to the US having a far higher proportion of higher-risk feedlot systems than New Zealand.<sup>9</sup> The Panel acknowledges Dairy NZ's view in its response to the preliminary report that the dairy cost would also need to be revised down due to different farming systems in the United States and New Zealand.
- s) Given the doubts over the reliability of the source data, the absence of corroborating data, and the differences in the US and New Zealand systems, it is unhelpful to take this comparison further.

---

<sup>7</sup> F.P. Maunsell, A.R. Woolums, D. Francoz, R.F. Rosenbusch, D.L. Step, D.J. Wilson, and E.D. Janzen. 2011. 'Mycoplasma bovis Infections in Cattle'. J Vet Intern Med 2011;25:772–783.

<sup>8</sup> US\$52.3 billion for beef (meat, cattle); US\$39.7 billion for dairy (cow milk, whole, fresh).

<sup>9</sup> This data shows a risk in the USA to dairy as a proportion of farm gate revenue which is 4.5 times higher than for feedlot beef, as almost all beef in the US is finished in feedlots. Dairy systems are different in the US, being essentially housed and fed mixed rations compared to the New Zealand grass fed situation. The Panel has been advised that clinical *M. Bovis* is more likely in situations of close contact and stress. Whilst US dairy systems are definitely close contact due to their higher nutritional plane and year round milking systems, it could be argued that they face less stress than the winter feeding conditions faced by the New Zealand herd. Individual cow production is approximately twice the NZ rate in the US. This data does indicate that the effects of *M. Bovis* are greater in dairy systems than in feedlot cattle systems.

### Herd size and impact

t) As the Parties are aware, the Panel's preliminary report included a recommendation for the initial cost share based on herd size and impact, and using the 90%/10% ratio as a starting point. Given the ongoing disagreement the Panel does not consider this will help the Parties reach a decision on cost shares, so has moved away from this model as the starting point of the Panel's initial cost share recommendation. However, it still provided a useful point of comparison. For the purposes of this calculation the Panel used the 90%/10% Initial Impact Assessment as the starting point, but departed from the interpretations of both industry parties. The calculation is as follows:

- The Panel assumed the average dairy herd is 414 animals<sup>10</sup> and the average beef herd is 350<sup>11</sup> animals (column 2).
- The Panel considered that because the 90%/10% includes the lost value of production on the average farm, it follows that *in relative terms*, the cost per animal is (9/414) for dairy and (1/350) for beef (column 3).<sup>12</sup>
- Multiplying the cost per animal (column 3) by the number of animals in New Zealand (column 4) gives the relative total cost in each industry (column 5).
- The last step is to use these two industry costs to apportion the total costs summed across both industries (columns 5 and 6).

### Expected costs and cost shares

Column	1	2	3	4	5	6
Industry	Clinical impact costs on average farm	Herd size on average farm	Clinical impact costs per animal on average farm (=col 1/col 2)	Total number of animals, YE June 2017	Total cost across all animals  (=col 3*col 4)	Cost share
Dairy	9	414	0.021739	4,986,800	108,409	91.32%
Beef	1	350	0.002857	3,607,600	10,307	8.68%
<b>Total</b>	<b>10</b>				<b>118,716</b>	<b>100%</b>

Source: Panel calculations

<sup>10</sup> New Zealand Farm Facts: <https://beeflambnz.com/sites/default/files/data/files/nz-farm-facts-compendium-2018.pdf>

<sup>11</sup> The sheep and beef farm survey, class 9.

<sup>12</sup> Note that the units of cost per animal are not important here. It is the relativities between costs that matter, not their level.

- u) These reasonableness tests support the Panel's opinion that we have not seen any information (whether empirical or anecdotal) indicating that a share for the beef sector above 10% can be justified. We say this because:
- If we used farm gate revenue alone and assumed equal impacts, the cost share would be ~80/20.
  - It is not credible, based on all available evidence, to judge that beef would be affected the same as dairy on a proportional basis.
  - In particular, extensive beef has an "extremely low" risk of clinical impact. Extensive beef accounts for over 40% of beef farm gate revenue.
  - If we assume zero risk for extensive beef (for illustrative purposes), and assume all remaining beef has the same risk as dairy, the implied cost share would be 86.8/13.2.
  - Clearly this is an over-estimate of non-extensive beef risk, and would not be credible.
  - However, this calculation indicates a number for beef above 10% would not be realistic.

## 10. Conclusions

- a) The Panel has settled on the at-risk revenue model as appropriate for setting the initial cost shares.
- b) The Panel recommends that the appropriate apportionment of cost share in accordance with clause 5.1.11 of the GIA Deed is that DairyNZ be allocated 95% of the total industry cost share and Beef & Lamb NZ 5%. Note that given the number of assumptions contained in our calculations, the Panel considers it is appropriate to round to the nearest whole number.
- c) The Panel also recommends this cost share calculation be revisited periodically if more New Zealand data on the probability of clinical infection by animal type and increased costs per infected animal becomes available.
- d) The Panel recognises the economic effects of *M. Bovis* are non-linear over time and therefore any future review may still not reflect the total cost of the response. The Panel considers that modelling at the time will be able to adjust for this, and in any case the Panel would expect the Industry Parties will agree to periodic cost share reviews as the response continues. The Panel is well aware that the Industry Parties are looking for definitive, perhaps incontrovertible, answers. As the Industry Parties know, and as the Panel has confirmed in its deliberations and in this report, there is not the hard data available to support such definitive answers.
- e) Both Industry Parties can be assured that the Panel has used its best endeavours to identify relevant sources of information, and considered the detailed submissions the Industries have made (even if the Panel has not specifically noted individual points in this report).
- f) In the absence of more definitive information the Panel considers there is little to be gained from continuing to refine its approach, as any further changes will be at the margins. In saying that, the Panel is happy to provide clarification of any of the points raised, but otherwise considers its task completed.

## 11. The next steps

- a) The conclusions of this report represent non-binding advice to the Industry Parties. If the Panel's work leads to agreement between the Industry Parties, the substance of the agreement will be scripted into the draft *M. Bovis* Operational Agreement.
- b) The Panel's recommendations have been prepared in accordance with the Terms of Engagement expressly to assist the Industry Parties apportion intra-industry cost shares for *M. Bovis*, and for no other purpose. In accordance with the Terms of Engagement, the Panel understands this report is confidential to the Parties and may only be disclosed to third parties with the Secretariat's permission.
- c) Given the lack of data on clinical impact and associated costs, the Panel's recommendation is necessarily only a best estimate based on the information that is available and the Panel members' own views and experience. The Panel has spoken to the TAG and understands that significant data from the response is likely to become available over the course of the next year, which should allow for a more precise calculation of relative impacts.
- d) The Industry Parties have expressed the hope that this report become a precedent for future cost share decisions. The Panel has expressed the methodology, including the formula, in a way that could be useful to further decisions, both between these Parties and also in other contexts, but also notes several factors which limit its value as a precedent, as outlined below:
  - Decisions and prior negotiations between the Industry Parties have settled many of the assumptions underlying this report and materially limited its scope.
  - The asymmetric nature of the impact of the organism, which differs between sectors, and changes at a different rate over time, has contributed to much of the complexity of the Panel's task, and would not be the case with many organisms — for example, Foot and Mouth would likely have an equal, immediately measurable impact on all sectors.
  - The epidemiological and clinical course of *M. bovis* in New Zealand is still developing, and its impact on particular types of farms and farming practices is unproven and in many ways a matter of (educated) guesswork. Clearly, there is a more than minimal prospect that the Panel's calculations (either inputs or methodological assumptions) may prove to be incorrect and/or overtaken by events.
  - MPI, which is necessarily a party to every OA, has not been a party to this report, although MPI has been helpful in providing information and access to experts.
  - There are no non-Signatory beneficiaries to the *M. bovis* OA. MPI pays the cost shares attributable to any non-Signatory beneficiaries and is obliged to seek to cost recover from them if it is equitable and efficient to do so (GIA Deed clause 5.1.14). Where there are non-Signatory beneficiaries MPI would therefore be likely to take a close interest in the way intra-industry cost shares are calculated.
- e) This report has not been written to support any particular approach to setting industry levies. The Panel notes the approach (in clause 5.1.11 of the GIA Deed) followed in producing this report is likely to be consistent with a proper approach to establishing an industry levy. However, that is a matter for MPI and the Industry Parties, and has not been in scope.
- f) The Panel will likely provide separate advice on any pan-GIA implications from its review.



## Appendices

### Appendix 1: Proposed longer-term formulation for cost shares

#### Introduction

- a) From an economic perspective we are exploring the beneficiaries' individual and combined willingness to pay to reduce economic damage from an unwanted organism.
- b) This should be calculated assuming no eradication response has taken place and minimal management options are in place.
- c) Both Parties indicated agreement that due to the relatively slow spread of this disease that would occur under an uncontrolled response scenario, assessing the benefits of a national response one year after detection for *M. Bovis* is not appropriate.
- d) The Panel recommends a 10 year period is more appropriate given the nature of *M. Bovis*. It is assumed that after 10 years, with no national response, the disease would be widespread.
- e) Each beneficiary's willingness to pay should reflect the expected benefits it will receive from the biosecurity response. The expected benefits are the expected avoided costs of the damage, including treatment costs, production losses and costs of management steps taken on-farm to avoid the clinical appearance of the disease.

#### A conceptual framework for *M. Bovis* cost share allocation

- f) The key variables that determine the costs of damage for each industry are:
  - the probability of clinical symptoms occurring in any one year, once the disease is widespread, assuming no eradication response and minimal management responses
  - the increased costs per animal that is clinically infected, as a share of that animal's production value<sup>13</sup>
  - the number of animals in New Zealand
  - the avoided cost of damage for each industry *i* can therefore be thought of as an expected value, as follows.

---

<sup>13</sup> These increased costs should include the decline in profitability per animal.

### Equation 1

$$\begin{aligned}
 \text{Expected benefit } i &= \text{Expected avoided costs of damage to industry } i \\
 &= [(\text{Probability of animal } i \text{ being clinically infected}) \\
 &\quad *(\text{increased costs as a proportion of animal's production value } i)] \\
 &\quad *[(\text{animal's production value } i) \\
 &\quad *(\text{number of animals in industry } i)]
 \end{aligned}$$

- g) The first term in square brackets determines the proportion of production value at risk in each industry.
- h) The last term in square brackets equates to the value of production, or farm-gate revenue.
- i) The total expected benefit is the sum of expected benefits for the two industries.
- j) As the Deed notes, the cost shares for each beneficiary should be proportionate to the benefits received. This suggests the cost share should be defined as:

### Equation 2

$$\frac{\text{Expected benefits } i}{\sum \text{Expected benefits } i} \quad \text{where } i = \text{dairy, beef}$$

- k) If the proportion of value at risk is the same for both industries, as it was assumed to be for Foot and Mouth Disease, then Equations 1 and 2 collapse into a cost share based on the industries' relative value of production (or farm-gate revenue).

### Precedents

#### **Fruit fly**

- l) In determining the industry cost shares for the Fruit Fly incursion, all affected horticultural beneficiaries agreed they were equally at risk — so the proportion of production value at risk was constant across beneficiaries.
- m) Using Equation 1 above, this means the first square bracket was constant across all horticultural beneficiaries.
- n) As a consequence, cost shares were pro-rated using Equation 2 based on the value of production (the second square bracket from Equation 1).
- o) Production was valued using a 4-year average of the sum of domestic and export sales (i.e. total production), based on 'first point of sale' prices.
- p) That is, each beneficiary's cost share was equal to its share of the total amount of horticultural production.

#### **Brown Marmorated Stink Bug (BMSB)**

- q) For BMSB, each beneficiary's cost share was estimated by:

- multiplying 'Industry value' by an 'Impact rating'<sup>14</sup> to give an 'Impacted value' for each beneficiary (this is analogous to multiplying the first square bracket in Equation 1 by the second square bracket)
  - dividing each beneficiary's 'Impacted value' by the sum of all beneficiaries' 'Impacted values' (this is Equation 2).
- r) Both precedent examples use the conceptual framework outlined above: they use both a proportion of production at risk parameter and the value of production parameter.

**Extending the conceptual framework to account for different probabilities of clinical infection and lost profits per animal**

- s) The conceptual formula above in Equation 1 can be extended to take into account the possibility that different types of beef cattle may have different probabilities of being clinically infected and different costs (decrease in profits) per infected animal.
- t) *M. Bovis* has been shown in other countries to cause greater clinical symptoms in situations where animals are under stress or held in close proximity to each other. It is acknowledged that dairy farming systems in New Zealand do vary in these respects, but the Panel considered them to be broadly similar enough for this exercise.
- u) New Zealand's beef farming systems are mostly extensively raised and grazed. But a significant proportion of New Zealand beef is sourced from the dairy sector where calf-rearing practices could present a risk profile of a magnitude that the Panel deemed it worthy of separate consideration. The same logic applies to situations of intensive grazing of beef.
- v) The Panel therefore considers four different types of beef system:
- extensive beef
  - intensively raised beef
  - feedlot raised beef
  - calf-reared and extensively-grazed beef.
- w) The expected benefits equation for the beef industry then becomes:

---

<sup>14</sup> This impact rating took into account preference impacts (which crops BMSB prefer as hosts), production impacts (on-orchard effects before a pest management strategy is in place) and downstream impacts (impact on processing). These were equally weighted.

**Equation 3**

$$\begin{aligned}
 \text{Expected benefit for beef} &= \text{Expected avoided costs of damage to beef} \\
 &= [(\text{Probability of extensive cattle being clinically infected}) \\
 &\quad * (\text{increased costs as a proportion of extensive cattle production value})] \\
 &\quad * [(\text{extensive cattle production value}) \\
 &\quad * (\text{number of extensive cattle})] \\
 &+ [(\text{Probability of intensively raised cattle being clinically infected}) \\
 &\quad * (\text{increased costs as a proportion of intensively raised cattle production value})] \\
 &\quad * [(\text{intensively raised cattle production value}) \\
 &\quad * (\text{number of intensively raised cattle})] \\
 &+ [(\text{Probability of feedlot raised cattle being clinically infected}) \\
 &\quad * (\text{increased costs as a proportion of feedlot raised cattle production value})] \\
 &\quad * [(\text{feedlot raised cattle production value}) \\
 &\quad * (\text{number of feedlot raised cattle})] \\
 &+ [(\text{Probability of calf-reared raised cattle being clinically infected}) \\
 &\quad * (\text{increased costs as a proportion of calf-reared cattle production value})] \\
 &\quad * [(\text{calf-reared raised cattle production value}) \\
 &\quad * (\text{number of calf-reared cattle})]
 \end{aligned}$$

- x) A similar process could be followed for the dairy industry if there are good reasons to consider different types of dairy systems.
- y) In the absence of any suggestion to the contrary, the expected benefits equation for the dairy industry is:

**Equation 4**

$$\begin{aligned}
 \text{Expected benefit for dairy} &= \text{Expected avoided costs of damage to dairy} \\
 &= [(Probability of dairy cow being clinically infected) \\
 &\quad * (\text{increased costs as a proportion of dairy cow production value})] \\
 &\quad * [(dairy cow production value) \\
 &\quad * (\text{number of dairy cows})]
 \end{aligned}$$

z) The formulae above explicitly consider the relative sizes of the two industries. They also account for different likelihoods that a beef or dairy cow will become clinically infected; and different per-animal profit impacts.

**Applying the formula in 2018**

aa) As noted above in paragraph f), three sets of parameters are required to populate the formulae:

- the probability of clinical symptoms occurring in different types of animal in representative year, once the disease is widespread, assuming no eradication response and minimal management responses
- the increase in costs per animal that is clinically infected, as a proportion of that animal's value of production
- the number of each type of animal in New Zealand.

bb) Unfortunately, and as confirmed with TAG via teleconference on 2 October 2018, there is very little New Zealand-specific data on which to make confident recommendations on the probability of clinical infection or the increased costs per infected animal.

cc) Data from overseas is similarly scant and complicated by:

- different farm systems being used
- the probability of infection and the increased costs per animal depend heavily on farmer responses, which vary considerably.

dd) Therefore, the only data points the Panel can reliably estimate in Equations 3 and 4 are the number of animals.

ee) The numbers of beef cattle by type were estimated from a range of sources. They can be easily updated if Beef & Lamb NZ has more detailed data.

## Appendix 2

### Information requests and documents reviewed by the M. Bovis Cost Share Panel

*Note – details as listed here may vary from actual document name*

1. GIA Deed
2. NZIER initial questions to industry 16 August 2018
3. Emailed instructions to industry ahead of cost share meeting 17 August 2018
4. Beef & Lamb NZ presentation to Cost Share Panel 21 August 2018
5. Beef & Lamb NZ cost sharing submission (dated 17 August 2018), includes May 2017 industry/MPI letter
6. DairyNZ presentation to Cost Share Panel 21 August 2018
7. DairyNZ cost sharing submission (dated 15 August 2018)
8. Emailed information from MPI on clinical impact 27 August 2018
9. Emailed request to industry seeking answers to supplementary questions
10. Beef & Lamb NZ response to Panel questions 28 August 2018
11. Additional email submission from Beef & Lamb NZ 31 August 2018
12. Additional emailed information from MPI about clinical impact 31 August 2018
13. DairyNZ response to Panel questions 31 August 2018
14. DairyNZ letter to Panel 7 September 2018
15. Potential-impact-of-Mycoplasma-bovis-on-the-NZ-beef-sector-FINAL (from MPI website)
16. DairyNZ qualitative paper on impacts to Dairy 11 September 2018
17. Clarifying email from DairyNZ regarding qualitative paper 11 September 2018
18. MPI Bovis Technical Advisory Group (all redacted versions taken from MPI website)
  - Initial Report
  - Updated Advice
  - April 2018 Report
  - May 2018 Report
  - Biographies of members
19. Cover email from MPI about Bovis impact in Australia
20. Notes (provided by MPI) of Technical Advisory Group discussion about Bovis epidemiology and impacts in Australia (26 April 2018)
21. Request for additional information from the Technical Advisory Group 14 September 2018
22. Request for additional information, and a process update 15 September 2018
23. Beef & Lamb NZ response to additional questions 20 September 2018
24. DairyNZ response to additional questions 20 September 2018.
25. Teleconference with the TAG on 2 October 2018
26. Teleconference with the authors of the Initial Impact Assessment on 2 October 2018
27. TAG response to GIA questions on impact of M. bovis to the dairy and beef sectors in NZ
28. Follow up questions to TAG about the economic impact of Bovis in USA (no answer at time of writing)
29. Request for information from Animal Health Australia about its cost share allocation process (response was phone call with GIA Secretariat 5 Oct 2018)
30. Submissions from the industry parties in response to the Panel's preliminary report
31. Provisional feedback from MPI on the results of the late 2018 spring testing